

## CLAIMS

I claim:

1. A process for cloning vitamin D<sub>3</sub>-binding protein (Gc protein) into baculovirus comprising the step of selecting and using a baculovirus vector to clone the vitamin D<sub>3</sub>-binding protein Gc protein (Gc protein).
2. A process for producing a cloned macrophage activating factor (GcMAFc) comprising contacting cloned Gc protein in vitro with immobilized  $\beta$ -galactosidase and sialidase and obtaining the cloned macrophage activating factor (GcMAFc).
3. A process for cloning vitamin D<sub>3</sub>-binding protein domain III (Gc domain III) into baculovirus comprising the step of selecting and utilizing a baculovirus vector to clone the vitamin D<sub>3</sub>-binding protein domain III (Gc domain III).
4. A process for producing a cloned macrophage activating factor (CdMAF) comprising contacting cloned Gc domain III in vitro with immobilized  $\beta$ -galactosidase and sialidase and obtaining the macrophage activating factor (CdMAF).
5. A method of treating a person suffering from cancer by administering to the person a therapeutically effective amount of a Gc protein macrophage activating factor (GcMAF), the GcMAF being a product of contacting serum Gc protein in vitro with immobilized  $\beta$ -galactosidase and sialidase.
6. A method of treating a person suffering from cancer by administering to the person a therapeutically effective amount of a cloned macrophage activating factor (GcMAFc), which is a product of the process according to claim 2.

7. A method of treating a person suffering from cancer by administering to the person a therapeutically effective amount of a cloned macrophage activating factor (CdMAF), which is a product of the process according to claim 4.

5 8. A method of treating a person suffering from human immunodeficiency virus (HIV), Epstein-Barr virus (EBV) or herpes zoster by administering to the person a therapeutically effective amount of a macrophage activating factor (GcMAF), which is a product of contacting serum Gc protein in vitro with immobilized  $\beta$ -galactosidase and sialidase.

10 9. A method of treating a person suffering from human immunodeficiency virus (HIV), Epstein-Barr virus (EBV) or herpes zoster by administering to the person a therapeutically effective amount of a macrophage activating factor (GcMAFc), which is a product of the process according to claim 2.

15 10. A method of treating a person suffering from human immunodeficiency virus (HIV), Epstein-Barr virus (EBV) or herpes zoster by administering to the person a therapeutically effective amount of a macrophage activating factor (CdMAF), which is a product of the process according to claim 4.

11. A macrophage activating factor (GcMAFc), which is a product of the process according to claim 2.

12. A macrophage activating factor (CdMAF), which is a product of the process according to claim 4.

20 13. A method of promoting bone marrow formation in osteopetrotic patients comprising administering a therapeutically effective amount of a macrophage activating factor (GcMAFc), which is a product of the process according to claim 2.

14. A method of promoting bone marrow formation in osteopetrotic patients comprising administering a therapeutically effective amount of a macrophage activating factor (CdMAF), which is a product of the process according to claim 4.

5 15. An adjuvant for immunizing humans and animals with antigens or vaccines, the adjuvant comprising a macrophage activating factor (GcMAF) which is a product of contacting serum Gc protein in vitro with immobilized  $\beta$ -galactosidase and sialidase.

16. An adjuvant for immunizing humans and animals with antigens or vaccines, the adjuvant comprising a macrophage activating factor (GcMAFc), which is a product of the process according to claim 2.

17. An adjuvant for immunizing humans and animals with antigens or vaccines, the adjuvant comprising a macrophage activating factor (CdMAF), which is a product of the process according to claim 4.

18. A cloned vitamin D<sub>3</sub>-binding protein (Gc protein) having an amino acid sequence of Fig. 3 (SEQ. ID. NO:1)(GcMAFc).

19. A cloned vitamin D<sub>3</sub>-binding protein domain III (Gc domain III) having an amino acid sequence of Fig. 5 (SEQ ID. NO:2)(CdMAF<sub>1</sub>).

20. A cloned vitamin D<sub>3</sub>-binding protein domain III (Gc domain III) having an amino acid sequence of Fig. 7 (SEQ ID. NO:3)(CdMAF<sub>2</sub>).